

CLAIMS

1. A method for manufacturing a microstructure having a thin-walled portion with use of a material substrate having a laminated structure which comprises: a first conductor layer; a second conductor layer; a third conductor layer; a first insulating layer which is patterned to have a first masking part for covering a thin-wall forming region of the second conductor layer, the first insulating layer being interposed between the first conductor layer and the second conductor layer; and a second insulating layer which is patterned to have a second masking part for covering the thin-wall forming region of the second conductor layer, the second insulating layer being interposed between the second conductor layer and the third conductor layer;

wherein the method comprises forming the thin-walled portion in the second conductor portion by etching the material substrate from the first conductor layer down to the second insulating layer via a mask pattern including a non-masking region corresponding to the thin-wall forming region of the second conductor layer.

2. The method according to Claim 1, wherein the material substrate further has a first communicating conductor that passes through the first insulating layer and electrically connects the first conductor layer and the thin-walled portion, and/or a second communicating conductor that passes through the second insulating layer and electrically

connects the third conductor layer and the thin-walled portion.

3. A method for manufacturing a microstructure having a thin-walled portion, comprising:

a material substrate lamination step for preparing a material substrate having a laminated structure which comprises: a first conductor layer; a second conductor layer; a third conductor layer; a first insulating layer which is patterned to have a first masking part for covering a thin-wall forming region of the second conductor layer, the first insulating layer being interposed between the first conductor layer and the second conductor layer; and a second insulating layer which is patterned to have a second masking part for covering the thin-wall forming region of the second conductor layer, the second insulating layer being interposed between the second conductor layer and the third conductor layer; and

a wall-thinning step for forming the thin-walled portion in the second conductor portion by etching the material substrate from the first conductor layer down to the second insulating layer via a mask pattern including a non-masking region corresponding to the thin-wall forming region of the second conductor layer.

4. The method according to Claim 3, wherein the material substrate lamination step comprises:

a first insulating layer formation sub-step for

forming, on the first conductor layer, the first insulating layer which is patterned to have the first masking part;

a first lamination sub-step for laminating the second conductor layer by depositing a conductor material onto the first conductor layer from the side of the first insulating layer;

a second insulating layer formation sub-step for forming, on the second conductor layer, the second insulating layer which is patterned to have the second masking part; and

a second lamination sub-step for laminating the third conductor layer by depositing a conductor material onto the second conductor layer from the side of the second insulating layer.

5. The method according to Claim 3, wherein the material substrate lamination step comprises:

a first insulating layer formation sub-step for forming, on the first conductor layer, the first insulating layer which is patterned to have the first masking part;

a first lamination sub-step for laminating the second conductor layer by depositing a conductor material onto the first conductor layer from the side of the first insulating layer;

a sub-step for forming a first pre-insulating layer on the second conductor layer; and

a second lamination sub-step for joining the first pre-insulating layer on the second conductor layer to a

second pre-insulating layer formed on a third conductor layer, the pre-insulating layer and the second pre-insulating layer together providing the second insulating layer which bonds the third conductor layer to the second conductor layer.

6. The method according to Claim 3, wherein the material substrate lamination step comprises:

a first insulating layer formation sub-step for forming, on the first conductor layer, the first insulating layer which is patterned to have a non-masking part corresponding to a comb forming region of the first conductor layer while also having the first masking part;

a first lamination sub-step for laminating the second conductor layer by depositing a conductor material onto the first conductor layer from the side of the first insulating layer;

a sub-step of etching the material substrate from the side of the second conductor layer, via a mask pattern for masking the comb forming region of the first conductor layer, to a halfway depth of the first conductor layer;

a sub-step of forming a first pre-insulating layer on the second conductor layer; and

a second lamination sub-step for joining the first pre-insulating layer on the second conductor layer to a second pre-insulating layer formed on the third conductor layer, the pre-insulating layer and the second pre-insulating layer together providing the second

insulating layer which bonds the third conductor layer to the second conductor layer.

7. The method according to Claim 3, wherein the material substrate lamination step comprises:

an intermediate material forming sub-step for preparing a material substrate intermediate comprising the second conductor layer, the third conductor layer, and the second insulating layer in between the second conductor layer and the third conductor layer;

a first insulating layer formation sub-step for forming, on the second conductor layer of the material substrate intermediate, the first insulating layer which is patterned to have the first masking part; and

a first lamination sub-step for forming the first conductor layer by depositing a conductor material on the second conductor layer from the side of the first insulating layer.

8. The method according to Claim 3, wherein the material substrate lamination step comprises:

an intermediate material forming sub-step for preparing a material substrate intermediate comprising the second conductor layer, a base layer, and the second insulating layer patterned to have the second masking part and arranged between the second conductor layer and the base layer;

a first insulating layer formation sub-step for

forming, on the second conductor layer of the material substrate intermediate, the first insulating layer which is patterned to have the first masking part;

a first lamination sub-step for laminating the first conductor layer by depositing a conductor material onto the second conductor layer from the side of the first insulating layer;

an insulating layer exposure sub-step for exposing the second insulating layer by removing the base layer; and

a second lamination sub-step for laminating the third conductor layer by depositing a conductor material on the second conductor layer from the side of the second insulating layer.

9. The method according to Claim 3, wherein the material substrate lamination step comprises:

a first insulating layer formation sub-step for forming, on a base conductor layer, the first insulating layer which is patterned to have the first masking part;

a sub-step of etching the base conductor layer to a depth corresponding to a thickness of the thin-walled portion, using the first conductor layer as a mask;

a first lamination sub-step for forming the first conductor layer by depositing a conductor material on the base conductor layer from the side of the first insulating layer;

a sub-step for forming the second conductor layer by

removing part of the base conductor layer, from the side opposite the first conductor layer, to such a depth that a remaining thickness of the base conductor layer corresponds to the thickness of the thin-walled portion;

5 a second insulating layer formation sub-step for forming the second insulating layer on the second conductor layer; and

 a second lamination sub-step for laminating the third conductor layer by depositing a conductor material on the
10 second conductor layer from the side of the second insulating layer.

10. The method according to any of Claims 4 to 9, wherein the first insulating layer formed in the first insulating
15 layer formation sub-step is patterned to further include a non-masking part for providing a communicating conductor, the communicating conductor being formed in the first lamination step by deposition of the conductor material in the non-masking part of the first insulating layer for
20 electrically connecting the first conductor layer and the thin-walled portion.

11. The method according to Claim 4 or 9, wherein the second insulating layer formed in the second insulating layer
25 formation sub-step is patterned to further include a non-masking part for providing a communicating conductor, the communicating conductor being formed in the second lamination step by deposition of the conductor material

in the non-masking part for electrically connecting the third conductor layer and the thin-walled portion.

12. The method according to Claim 4, wherein the second lamination sub-step comprises forming a film of the conductor material on the second conductor layer from the side of the second insulating layer, and then subjecting the conductor material to epitaxial growth.

13. The method according to Claim 5 or 6, further comprising the steps of: forming a through-hole that passes through the third conductor layer and the second insulating layer to reach the second conductor layer; and forming a communicating conductor for electrically connecting the third conductor layer and the thin-walled portion by supplying a conductor material into the through-hole.

14. The method according to Claim 7, wherein the first insulating layer formed in the first insulating layer formation step is patterned to further include a first non-masking part for providing a first communicating conductor, the method further comprising, as steps performed after the first insulating layer formation sub-step but prior to the first lamination sub-step, etching the second conductor layer down to the second insulating layer with use of the first insulating layer as a mask, and forming a second non-masking part for a second communicating conductor in the second insulating layer,

and wherein the second communicating conductor is formed by deposition of the conductor material in the second non-masking part in the first lamination step for electrically connecting the third conductor layer and the thin-walled portion.

15. The method according to Claim 8, further comprising forming a non-masking part in the second insulating layer after the insulating layer exposure step for providing a communicating conductor, wherein the communicating conductor is formed by deposition of the conductor material in the non-masking part in the second lamination step for electrically connecting the third conductor layer and the thin-walled portion.

16. A method for manufacturing a microstructure having a thin-walled portion with use of a material substrate having a laminated structure which comprises a first conductor layer, a second conductor layer, and a first insulating layer interposed between the first conductor layer and the second conductor layer; wherein the method comprises the steps of:

forming the thin-walled portion touching the first insulating layer by performing a first etching treatment with respect to the second conductor layer of the material substrate with use of a first mask pattern having a masking part covering a thin-wall forming region of the second conductor layer;

coating the thin-walled portion with an etching stop film;

laminating a third conductor layer on the second conductor layer to bury the thin-walled portion; and

5 performing a second etching treatment from the side of the third conductor layer down to the first insulating layer with use of a second mask pattern having a non-masking region corresponding to the thin-wall forming region.